

Green Suppliers Network: Strengthening and Greening the Manufacturing Supply Base

As large manufacturers increasingly rely on lengthy supply chains, the environmental impacts of suppliers continue to grow. A voluntary program called the Green

Suppliers Network is helping provide suppliers with on-site technical assistance that aims to improve their process efficiency, business profits, and environmental performance.

This article explains the program's innovative design, how the program works, and the results it is achieving.

The Changing Business Model for Manufacturers

Corporations have changed the way they do business over the past 20 years. In an effort to cut costs, America's largest manufacturers began outsourcing some of their production to smaller companies, both within and beyond the U.S. borders. As a result of this changing business model, large manufacturers have developed lengthy sup-

Helping the small companies that supply America's large manufacturers

ply chains that often include hundreds, or even thousands, of small manufacturers.

According to the U.S. Bureau of Labor and Statistics, in 2002 there were

344,188 manufacturing establishments in the United States.¹ Almost 90 percent of these establishments meet the Small Business Administration's definition of "small business" (having 500 employees or fewer per facility).

Small manufacturing establishments account for 6 million (out of a total 14 million) people employed in U.S. manufacturing. While this number includes both small companies and smaller facilities within larger manufacturing corporations, it is clear that most U.S. manufacturing occurs in small facilities.

As a result of the structural changes that have occurred within industry, large manufacturers are

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dependent on the productivity and solvency of their small and medium-sized manufacturing suppliers in ways they never were before. Ironically, as this dependency has increased, the length and complexity of supply chains is causing the entities involved to become more segregated.

In most cases, large manufacturers have little or no contact with their lower-tier suppliers. This can create problems for manufacturers because, even while outsourcing disperses environmental impacts throughout the supply chain, the public still holds large manufacturers responsible for the environmental effects of their final products and components.

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Large companies are now recognizing their connection to the cumulative environmental footprint of suppliers. Notes Harold Kutner, group Vice President of

Worldwide Purchasing and North American Production Control and Logistics for General Motors, "Working together with our suppliers, we can accomplish much more to improve the environment than GM can alone."²

Large manufacturers have the financial and technical resources to ensure that they are including environmental considerations in their manufacturing decisions, but they do not have the resources needed to reach out to their entire supply chain.

Corporations are also mindful of the legal liability issues that may be involved. If a large corporation tells a supplier to make a particular change on the factory floor, and the change results in an occupational hazard, the large corporation ultimately could be held responsible.

Small suppliers often do not have adequate resources to devote to environmental issues, as they

are constantly being pressured by their customers to cut costs and remain competitive. Yet as more industrial sectors have turned to small manufacturers for components, the cumulative economic and environmental impact of small suppliers has grown, and will continue to grow.

Keeping Pace with Business

In this changing marketplace, a question arises: How can large manufacturers help their suppliers remain competitive and efficient, while also ensuring that they operate in an environmentally sound manner? The Green Suppliers Network offers a solution.

Small manufacturers need on-site help to reduce waste and improve environmental performance. That's where the Green Suppliers Network comes in. The Green Suppliers Network is a voluntary program, jointly sponsored by industry, the United States Environmental Protection Agency (US EPA), and the United States Department of Commerce (US DoC).

The Green Suppliers Network provides assistance on lean manufacturing and pollution prevention to small and medium-sized manufacturers through on-site technical reviews. These dual-focused reviews identify and quantify operational and environmental improvement opportunities that can help companies create effective processes and products, generate higher profits, and reduce environmental impacts.

Establishing the Business Case for Change

Small manufacturers rarely have resources to devote to environmental issues. The key to getting small manufacturers to pay attention to their environmental footprint is to demonstrate that reduced environmental impacts can improve their bottom line.

Many manufacturers acknowledge the benefits of lean manufacturing, a paradigm that aims to eliminate all non-value-added activities and

wastes through continuous improvement. Lean manufacturing benefits include:³

- reduced cycle time;
- reduced inventory;
- reduced work-in-progress;
- reduced costs;
- increased capacity;
- improved lead times;
- increased productivity;
- improved quality; and
- increased profits.

Many of these benefits can be expanded by including environmental considerations in the lean manufacturing approach. This expanded strategy, which often is referred to as “clean manufacturing,” involves broadening the definition of waste to include air and water emissions, solid and hazardous waste generation, and toxics use.

The results attained by combining “lean” and “clean” manufacturing into one approach can be staggering: savings to individual companies in the hundreds of thousands of dollars, improvements to production efficiencies, and enhancement of overall environmental performance.

GM Saturn Pilot Results

In 2001, a Green Suppliers Network pilot project with General Motors (GM) Saturn Corporation found that four supplier manufacturing facilities could realize over \$1 million in cost savings by implementing environmental and operational improvement opportunities identified during the program’s review process.⁴

The review generated 16 improvement recommendations, almost all of which were capable of creating direct cost savings for the supplier facilities. In addition, five of the opportunities also offered direct cost savings to GM. Twelve of the 16 opportunities were related to environmental improvements.

The Green Suppliers Network’s Innovative Approach

Clearly, the Green Suppliers Network offers an important option for supplier manufacturing facilities. The issue then becomes: How can the program reach the many small suppliers who could benefit from assistance?

Partnering with NIST MEP

To meet this challenge, US EPA has paired with the U.S. Department of Commerce National Institute of Standards and Technology’s Manufacturing Extension Partnership (NIST MEP) program. NIST MEP centers are the nation’s leading provider of lean manufacturing technical assistance to small and medium-sized manufacturers.

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NIST MEP centers usually derive one-third of their funding from the federal government, an additional one-third from the state government of the jurisdiction where they are located, and one-third from fees for their services.

With 60 centers located throughout the United States, and nearly 1,500 field staff, NIST MEP has a strong national presence. NIST MEP ensures that each MEP center has a core set of competencies in lean manufacturing, and that the program offers consistent service in each state.

Combining Lean and Environmental Expertise

A Green Suppliers Network lean and clean review team usually consists of one MEP lean expert and one environmental expert. In most cases, the environmental expertise is augmented by each state’s technical assistance providers (TAPs). The various state TAPs have different areas

of focus (including pollution prevention, waste minimization, and energy efficiency), but all are well versed in the concepts of process improvement and material substitution.

By combining these two skill sets (lean and environmental), Green Suppliers Network reviews offer small and medium-sized manufacturers a unique opportunity to identify operational and environmental solutions simultaneously.

Reaching Out to Smaller Companies

Perhaps the greatest attraction of the Green Suppliers Network program is that all cost savings resulting from implementing review recommendations remain with the suppliers themselves.

The next issue involves how to identify and encourage participation by thousands of smaller manufacturers, many of which operate below the radar screen. The Green Suppliers Network uses an innovative top-down approach: working with large manufacturers (also known as original equipment manufacturers, or OEMs) to identify, and drive the participation of, small and medium-sized manufacturing suppliers.

In some cases, suppliers are also recruited using a bottom-up approach, as states and MEP centers use their existing relationships with companies to encourage participation.

Aligning Interests

The Green Suppliers Network offers a successful model for strengthening and greening company supply chains because it aligns the interests of suppliers, OEMs, state governments, and federal government agencies.

The program offers a way for suppliers, OEMs, and government agencies to work collaboratively to improve the environmental and economic impacts of the supply base through fostering a commitment to continuous improvement.

Suppliers

Despite their limited resources, suppliers are willing to participate in Green Suppliers Network review because it offers low-cost, on-site technical assistance in lean and clean manufacturing, which can add to their bottom line.

While lean manufacturing is a paradigm that has existed in industrial practice for several decades, many small manufacturers do not have the resources to pay for on-site assistance that can help them take advantage of lean methods. Green Suppliers Network review offers a low-cost, hands-on solution.

The review process focuses training on a single process line at the supplier facility but allows employees to learn how to apply lean and clean methods to other process lines as well. Steve Beurkens, a manager at H&L Advantage, a small injection-molding manufacturer located in Grandville, Michigan, states that because of the on-site training that occurred during his company's Green Suppliers Network review, "We are now able to start new events ourselves. . . . The lean and green principles have become our way of doing business for everything we do at H&L, and it's now in our DNA."

Perhaps the greatest attraction of the Green Suppliers Network program is that all cost savings resulting from implementing review recommendations remain with the suppliers themselves. Typically, a Green Suppliers Network review costs the supplier about \$7,000.⁵ The return on that investment generally is greater than three-to-one.

While suppliers are not required to share these cost savings with their customers, having the extra cash affords them the opportunity to remain competitive and grow their businesses.

Suppliers also like the fact that their largest customers, the OEMs, are involved in the process. In some cases, customer specifications are among the main factors that hinder supplier improvements in efficiency and environmental perform-

ance. A Green Suppliers Network review often can serve as a third-party confirmation of the nature of such barriers, while also providing a forum for small suppliers to work with their large OEM customers to remove the barriers.

An important part of the Green Suppliers Network program is ensuring that all facility-specific information remains confidential. All facility review reports remain with each MEP center, and OEMs and US EPA view only aggregate data. This ensures that OEMs cannot identify a specific supplier's results and ask the supplier for cost reductions based on them. Facilities can decide to share their individual results with customers and with US EPA, and some have done so.

OEMs

OEMs agree to participate in the Green Suppliers Network program because the health and financial stability of their supply-chain manufacturers is integral to their own success.

Many OEMs want to help their suppliers operate more efficiently and achieve better environmental performance, but they do not have the resources to help all the companies in their supply chain. Participating in the Green Suppliers Network enables OEMs to leverage governmental resources and expertise to assist their supply-chain members. Says Mary Ellen Mika, a manager at Steelcase:

The Green Suppliers Network is an extension of our in-house efforts to continuously improve. We see it as a "win-win" for Steelcase and our suppliers. If waste—and therefore unnecessary cost—can be removed from our suppliers' processes, that translates into a stronger supply chain, which is good for both of us.

The Green Suppliers Network program also enables OEMs to reconnect with their lower-tier

suppliers, with whom they otherwise might have little contact. The aggregate results achieved by small supply-chain companies offer OEMs confidence that their suppliers are working to improve their operational and environmental performance.

State Governments

State governments support the Green Suppliers Network program because it offers their state's manufacturers the expertise and know-how they need to remain competitive in the global marketplace. Competitive suppliers create and retain jobs in the community, thus having a measurable positive impact on the state's economy.

The program also assists state environmental regulatory agencies, as the Green Suppliers Network becomes a delivery mechanism for pollution prevention information and resources. According to Laura Rauwerda of the Michigan Department of Environmental Quality (DEQ):

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The Green Suppliers Network encourages the leveraging of waste reduction and environmental management programs in such a way that both federal and state expertise on these topics may be shared with industries of any size to assist them in successfully achieving their production performance goals while improving their profitability and strengthening relationships.

Federal Government Agencies

The Green Suppliers Network program helps fulfill the missions of US EPA and US DoC to improve the environmental performance and eco-

conomic vitality, respectively, of American manufacturers. While suppliers may be small individually, the cumulative economic and environmental footprints of the supply base are large within the nation's communities.

How the Green Suppliers Network Operates

Getting Started

Program participation generally begins with a large manufacturer or OEM approaching Green Suppliers Network staff at US EPA or US DoC to learn more about the program and start the process of joining it.

By involving all levels of employees, the Green Suppliers Network review team is able to obtain the input needed for process change, in addition to getting worker buy-in.

Next, Green Suppliers Network personnel work with the company to educate staff in its environmental, purchasing, and supplier development departments about the program. In some cases it has be-

come apparent that the environmental, health, and safety (EHS) and purchasing departments at these companies have had minimal interaction prior to their participation in the Green Suppliers Network program.

Once connections have been made, all groups meet to decide what kind of suppliers to nominate for program participation. A company can decide to target suppliers based on a number of factors, including product lines, financial stability, a history of environmental challenges, likelihood of participation, or a desire to meet other OEM corporate goals (such as reaching out to minority-owned suppliers).

Involving Suppliers

Once suppliers are invited and have committed to participating in the Green Suppliers Net-

work program, a MEP lean expert and (usually) a state pollution prevention expert meet with the supplier to identify and prioritize issues and implement solutions that can achieve business and environmental results.

- ***Understanding the Process***

The review looks at one process line per facility. The first step in the review process seeks to understand the current state of the process. This involves a benchmarking exercise and "walking the floor" to understand how the company's financial and operational performance compares with the performance of others in its sector.

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- ***Mapping the Current Process***

The next step involves training the facility team on how to create a value stream map and process map showing the current state of the process.

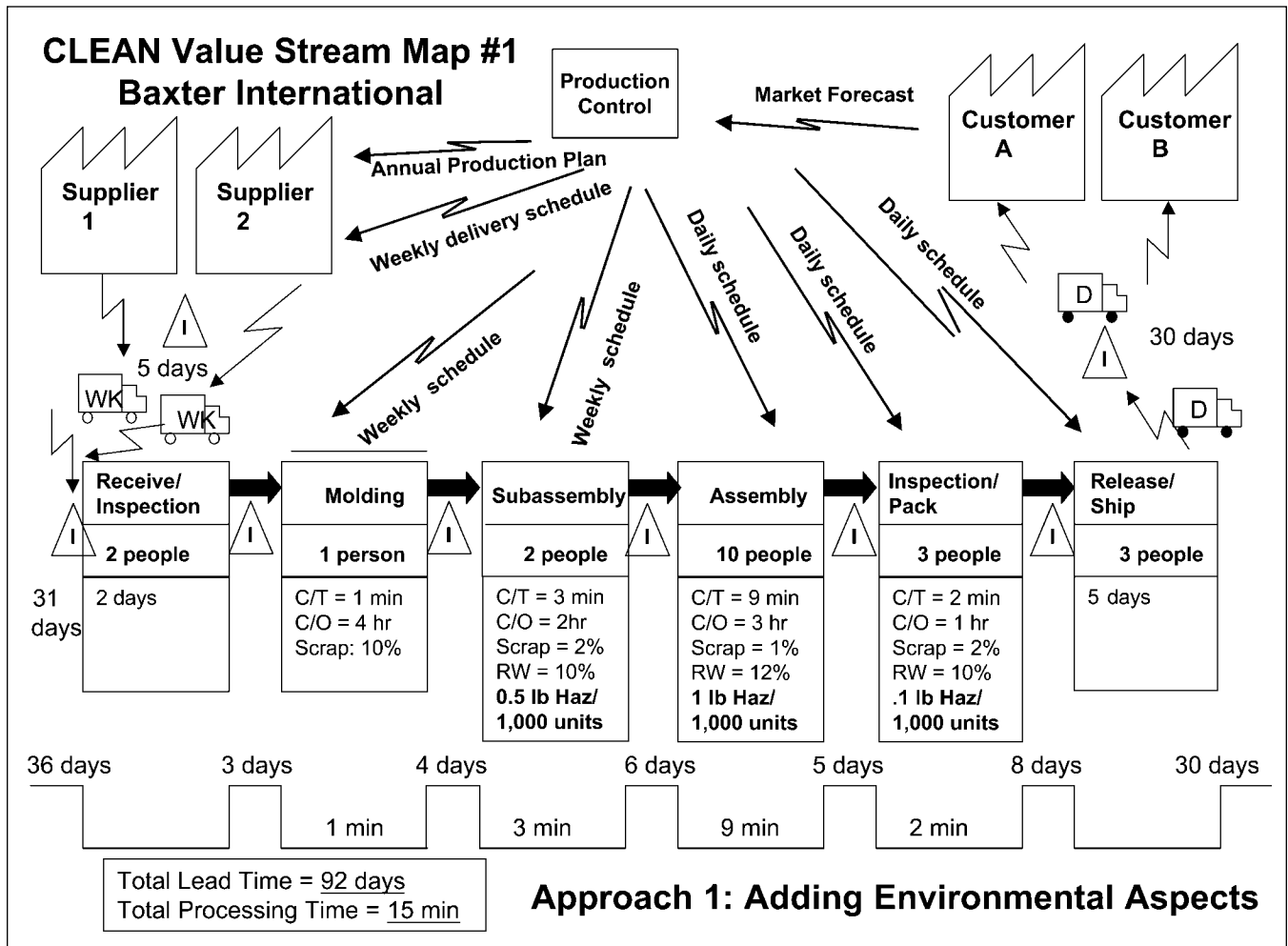
A value stream map is a lean tool that is "used to create a material and information flow map of a product or process."⁶ The map begins with raw materials and continues through to the final product. It aims to identify places where value is lost or gained through a set of activities. **Exhibit 1** illustrates an example of a value stream map used by Baxter International.

A process map is a tool that evaluates the inputs and outputs of a process to identify waste generation.

- ***Creating "Future-State" Maps***

Once the current state of the process is mapped, the Green Suppliers Network review team helps suppliers create future-state value stream maps and process maps indicating how the process is to be improved. This empowers

Exhibit 1. Value Stream Map



suppliers to align and prioritize their operational goals.

- **Final Report**

Review team members then generate a final report that lists operational and environmental improvement opportunities and evaluates these opportunities in a cost-benefit analysis. This information remains with the supplier, who can then implement the opportunities based on its own priorities.

Implementation Incentives

In order to help ensure that suppliers have the resources to act on the opportunities identified in

their reviews, the Green Suppliers Network offers implementation incentives. Suppliers are eligible for a \$1,000 implementation credit if they begin working on an environmental project within three months of the Green Suppliers Network review.

The Green Suppliers Network also helps suppliers on industrywide environmental issues, such as packaging (in the automotive sector) and toxics use reduction (in the office furniture sector).

Companies Participating in the Green Suppliers Network

The Green Suppliers Network began in 2001 as a pilot project in the automotive sector, work-

ing with General Motors.⁷ Since the pilot's initial success, the program has grown to include 24 OEMs in the aerospace, office furniture, and health care/pharmaceutical sectors.

While these companies are in various stages of program participation, collectively they have already identified 103 suppliers that they would like to see participate in the Green Suppliers Network program. An additional 35 suppliers are either in-process or are finalizing plans to complete reviews.

Getting Results

Since the pilot project, 29 suppliers have undergone Green Suppliers Network review. **Exhibit 2** shows aggregated results identified during the supplier reviews that had been completed as of October 2005.

These results include estimates for one process line per facility only. They do not include the benefits that can be achieved when the identified improvement opportunities are applied to additional process lines within the target companies.

Case Study: Medegen MMS

Many supplier participants currently are working to implement recommendations made during their Green Suppliers Network reviews. One such company is Medegen Medicine Manu-

facturing Services (Medegen MMS) of Ontario, California. In the spring of 2003, Medegen became the first health care supplier to undergo Green Suppliers Network review.

The company, a supplier of injection-molded parts to the health care industry, employs 180 workers. After being invited by one of their largest customers to participate in a Green Suppliers Network review, Medegen assembled a cross-functional team that included material managers, representatives from accounting, engineering, and quality control, and manufacturing floor employees to participate in the process.

As part of the Green Suppliers Network review team, California Manufacturing Technology Consultants (local MEP experts) worked with Medegen to identify 13 lean and clean improvement opportunities. In less than two years, Medegen implemented nine of the review recommendations, realizing significant cost savings and environmental improvements in the process. Medegen's accomplishments include:

- Investing in six energy-efficient injection-mold presses. This enabled the company to retire 14 old presses and eliminate 660 gallons of hydraulic oil waste.
- Changing the injection-mold cleaning method to one that uses ultrasonic cleaning

Exhibit 2. Potential Financial and Environmental Savings Identified from Green Supplier Network Reviews*

Value of Environmental Impact Savings	\$4,305,161 per year
Energy Conservation (MM Btu/kWh)	221,789/64,983,720
Water Conservation (gallons)	8,930,459
Air Emissions Reduction (lbs)	81,200
Solid Waste Reduction (lbs)	573,669
Hazardous Waste Reduction (lbs)	2,700
Toxic Hazardous Chemical Use Reduction (lbs)	600
Water Pollution Reduction (gallons)	128,250
Value of Lean Opportunities	\$12,375,349 per year
Value of Other Cost Savings Opportunities	\$189,193
Total Potential Impact	\$16,869,703 per year
Value of One-Time Lean Opportunities	\$8,421,466

* Aggregate results for 29 supplier reviews completed as of October 2005.

tanks and a mild citric acid cleaner. This change reduced hazardous waste generation by 50 percent. By eliminating the need for kerosene, acetone, and cleaning cloths, the company also saved the costs associated with waste removal.

- Replacing the water cooling system with a machine that responds to actual cooling demand requirements. This modification reduced Medegen's electrical energy consumption and costs by 2.3 percent annually.
- Changing the way the facility internally packages products for reuse in its operations. This change greatly reduced the facility's generation of cardboard and plastic waste.

Case Study: H&L Advantage

In addition to realizing direct cost savings and achieving environmental improvements, some companies experience collateral benefits through participation in the Green Suppliers Network program. This has proved to be the case for H&L Advantage, a small injection-molding manufacturer located in Grandville, Michigan.

Through the Green Suppliers Network review process, H&L Advantage worked on site with Michigan DEQ and The Right Place, Inc., West Michigan's MEP center. These experts in lean and clean manufacturing techniques helped H&L Advantage identify over a dozen improvement opportunities. In addition, H&L Advantage credits the Green Suppliers Network with helping it achieve the following:

- Remaining competitive with its customers: H&L Advantage has committed to implementing most of the recommended lean and clean improvement opportunities over the next year. These opportunities, when fully implemented, could save the company 10 to 15 percent in operating costs. After realizing the potential savings that could be gained

from implementing these opportunities, H&L Advantage plans to offer cost controls, and possibly even cost reductions, to its customers.

- Integrating lean techniques into its operations: After at least two previously unsuccessful attempts to implement lean principles using only its own resources, H&L Advantage believes that the Green Suppliers Network on-site training approach made it easy for them to learn, apply, and implement lean techniques within their facility.
- Accessing state pollution prevention resources: As a small business, H&L Advantage was not aware of the information, resources, and assistance programs that were available to them from US EPA and Michigan DEQ. Since working with these agencies through the Green Suppliers Network, H&L Advantage plans to take advantage of a number of state programs, including a DEQ intern program that will support implementation of opportunities discovered during the program review process.

The Green Suppliers Network program offers on-site technical assistance in lean manufacturing and environmental improvement to small and medium-sized companies that supply to large manufacturers.

Conclusion

The Green Suppliers Network program offers on-site technical assistance in lean manufacturing and environmental improvement to small and medium-sized companies that supply to large manufacturers. By helping to align the interests of many key players (including suppliers themselves, their large customers, and state and federal government agencies), the program offers important resources for companies that are dedicated to greening their supply chain while improving their bottom line.

Participation in the program is the first step in helping suppliers improve their environmental performance, become more competitive, and focus on continuous improvement. As the manufacturing business model continues to evolve, the Green Suppliers Network will continue to help ensure that the U.S. manufacturing supply base has the resources it needs to remain lean, green, and competitive.

For More Information

For more information about the Green Suppliers Network, visit the program Web site at www.greensuppliers.gov.

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Notes

1. Bureau of Labor and Statistics. 2002 County Business Patterns.
2. General Motors. (1999, September 21). General Motors sets new level of environmental performance for suppliers. Press release.
3. www.mep.nist.gov/lean/lean.html.
4. Reed, L. (2003). Greening the supply chain: A study of Saturn Corporation manufacturing facilities. *Environmental Quality Management*, 13(1), 3–17.
5. US EPA currently offers a \$2,500 subsidy for suppliers who commit to review. The subsidy will be offered only during the initial stages of the Green Suppliers Network program, and while funds are available.
6. See note 3.
7. The automotive group has formed a trade association to manage its Green Suppliers Network activities. For more information, see www.supplierspartnership.org.

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